

“Samudra Manthan” Story of Hindu Mythology in Present Perspective
By VR Patil (email: vrpmet@yahoo.com)

Introduction:

Samundra Manthan story is found in some texts of Hindu Mythology, such as Bhagavata Purana, Visnu Purana and also in the Mahabharata epic. It actually depicts a process of obtaining **Amrit**/Nectar of immortality from the ocean of milk. But **Ambrosia** does not come in the hands of Gods so easily. To achieve the set goal, both Gods and Asuras have to join hands first, work together under the guidance and supervision of **Visnu**, and pass the tests of various difficulties encountered during the process of churning of ocean with a great patience as well. Some experts see symbolism hidden in it and try to connect it with the spiritual aspects seen in day to day life of a person by way of withdrawal of the senses via concentration of mind, and achieving Immortal State/detachment by exercising control over the various desires (Yogic Practices).

There are some differences in the Samundra Manthan story from text to text. The first version of the story would have been composed anytime between 400 BCE to 300 AD. In a first look, the story appears to be just like any other mythological story. By using **Investigation Approach**, with the help of available **Scientific information** on the subjects like Formation of Earth and its Geological History, Origin of Life on Earth, the Process of Evolution of various living things including human; when the very same story is reconstructed in a different fashion, then it brings out altogether different features that were unknown to us earlier. In mythology, the Deities are portrayed as the immortal characters possessing special powers, but here they are treated as the elements of nature/universe. In the present essay, an attempt has been made to correlate some important mythological features that are found in the said story with the real events that would have occurred in the past, and also with the selected factual things present in the universe today. **The order of the various Items/Jewels obtained during the process of churning of ocean has been intentionally selected or adjusted so as to meet the desired goal.** Additionally, some aspects of the **Management Principles** drawn from the

story have also been highlighted in a separate paragraph. Please note that there is no slighted intention to hurt anyone's faith.

Background of the Samudra Manthan Story:

Once an act of God **Indra** makes Sage **Durvasa** very angry who in turn curses **Indra** and all Gods that they would lose wealth, power, and immortality. After the incidence, when the Gods (Devas) fight battle with the Asuras (Demons), they end up as the loser, and **Bali** king of Demons takes control of the universe.

Having experienced the defeat at the hands of Asuras, and loss of numerical strength in the battle, then **Indra** and his fellow Gods decide to do something and first approach God **Brahma** who clearly informs them that **He** is not a right person to guide them to obtain solution to the problem, but tells them to go to God **Visnu**.

After listening to **Indra**, God **Visnu** prepares a detail plan of obtaining Amrit/nectar through the process churning ocean of milk. He also tells the **Gods**, it is an uphill task, and hence they need to take the help from the **Asuras** as well. Accordingly, the **Gods** contact the **Asuras** and invite them to participate in the **Samudra Manthan**, who happily agree to do so.

As per plan of **Visnu**, **Mount Mandara** is chosen as a churning rod/stirrer, and **Vasuki** the King of Serpents, is selected as a churning rope. While positioning **Mandara** as a stirrer in an ocean, due to its own weight when the mountain starts sinking, then **Vishnu** puts himself in action. By taking shape of **Kurma**/tortoise **He** goes down **Mandara** and supports it from the base. In this way, **Visnu** burdens himself with the load of mountain **Mandara**. Additionally, to avoid wobbling of mountain during the process of churning, God **Brahma** is made to sit on the top of **Mandara** to provide necessary stability during rotation of a stirrer.

Under the supervision of **Visnu**, the Gods and the Asuras start the process of churning the ocean, and one by one things start coming out of the Ocean of Milk. In total, fourteen Ratna/Jewels are obtained from Samudra Manthan; some of them are beneficial things and some are harmful objects too. As per the legend, **Halahal** the poison comes first and the **Amrit Kalasha**/ a Pot of Nectar arrives with Dhanvantari at the last. In between, other items are churned out of the ocean. As per the story, some objects

gained from the ocean are given to Lord Shiva, some to Lord Visnu, and remaining are divided between the **Gods** and the **Asuras**, but the former take the lion's share.

As the list of 14 Jewels differs from book to book, the selection and sequence of emergence of all items for the present article is mainly based on the **Logic** of the likely order of various **natural events** that are reported in the scientific literature by the various researchers/ the experts belonging to the different fields.

A. Fourteen Jewels Obtained from Samudra Manthan as seen in Present Perspective:

Samudra Manthan is one of the widely read stories of the **Hindu Mythology**. Around 2000 years ago, the composer has really used his lofty imagination and presented the story in such a way that even today, in the modern world of science, we find it very interesting to read. Since a long, man has been trying to become **Immortal**, but he is yet reach that stage.

In the following paragraphs, one by one, fourteen objects obtained from the process of churning are independently presented. In the beginning of each paragraph, each Ratna/item comes out of the process of churning is explained in one or two sentences as the traditional beliefs. Subsequently, same thing is described in a brief in a scientific manner using a non-conventional or “**out of box thinking**” approach.

1. Hala-Hala - the Poison:

It is the first item that comes out of the churning of ocean. As no participant whether God or Asura comes forward to take the responsibility of disposing of the poisons gas generated during churning, Gods request **Shiva** to do the needful. While swallowing the Halahala, Shiva's throat becomes blue in colour, and hence, from the story **Shiva** gets a new name as **Neelkantha**.

“Halahala” in present perspective

Based on the available scientific information, in the present context, mythological concept of **Halahala** can be easily linked to the conditions prevailed during “**Origin of**

Earth". On a Geological Time scale (GTS), Planet Earth is believed to have formed around 4.54 Billion Years ago from the Solar Nebula. Initially, Earth was a just molten mass, and from molten state, nearly 100 to 500 million years would have been taken to form the earliest solid layer called as earth-crust today. During the formation of the first layer of crust, for several years, then the molten mass of Earth would have constantly released Heat and Several Poisonous Gases into **Space** (it is said that the first layer of solid crust would have formed about 4 billion years ago). Continuous Emission of Heat and Gases during the solidification process of Earth for many years through natural cooling mechanism can be termed as **Halahala** in the modern context.

Every year, we come to know about the eruption of the several destructive and dangerous Volcanoes located along the **"Ring of Fire" region** (situated along the sides of Pacific Ocean covering parts of three major continents i.e. Eastern part of **Asia**, west coast of **North America** and west line of **South America**) causing release of molten lava, hot poisonous gases such as carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrochloric acid and carbon monoxide, water vapour, and volcanic ash/tons of dust forcing the people living nearby to move away from the affected area. This fact clearly shows, despite the elapse of around 4.54 billion Years, Mother Earth still holds fire/heat in its core or interior and releases the same from time to time in various increments. **Recently, the Scientists have found the evidence indicating formation of earth-crust and ocean as early as 150 million years after the formation of Earth.**

2. Chandra or Moon :

The next item comes out of ocean is the **Chandra** or Moon. As per the story, it is given to **Shiva** who has adorned the same on his head.

Origin of Chandra / Moon

There are many theories proposed by the scientists in the last 200 years, and the names of some old theories are give below.

1. "Fission" theory : The Moon broke off the Earth
2. "Sister" theory : The Moon formed in orbit around the Earth
3. "Capture" theory: The Moon is captured from somewhere

Among one of the recent theories that is originated around 50 years back, and regularly in discussions the **Giant impact hypothesis**. It is the most popular one as it has backing of members of many scientific communities. It states that when Earth was getting its shape from left over cloud of dust, many similar bodies would have been formed in our solar system. During the process of rotation around the Sun, a Mars-sized body known as **Theia**, would have collided with newly born Earth leading to creation of Moon that was closer to Earth earlier. Giant impacts are thought to have been common in the early Solar System. It is also claimed that this hypothesis supports the presence of axial tilt of the 23.5° of the Earth that causes seasons on the planet.

It is believed the Moon would have formed about 4.51 billion years ago. Some characteristic features of the Moon are as under.

- less denser than the Earth.
- relatively bigger in size than any other moon in the Solar System.
- previously closer to Earth but slowly drifting away from the Earth.
- carries most of the angular momentum in the Earth–Moon system.
- poor in volatile elements that are found on the Earth.
- practically no folding mountains or volcanoes.
- absence of water and atmosphere like Earth.
- identical isotopic “fingerprint” for both the Earth and Moon. Even the meteorites in the Solar System have different elemental composition.

3. Kaustabh-mani : As per the story, it is the most valuable Jewel in the world, given to Visnu.

Diamond as Kaustabh-mani

Diamond (a gemstone) is a naturally occurring an allotropic form of carbon. Presence of covalent bonding between two adjacent carbon atoms and a typical diamond cubic structure make the Diamond, the hardest among the all naturally occurring substances.

The earth scientists say that Natural Diamonds were formed 150km – 250km deep below the earth’s crust in the melted rock of the mantle most probably ages between 1 billion and 3.5 billion years, when the Carbon molecules got compressed under very high pressure of 45 to 60 kilo bar in presence of intense heat of the order

of **900 degrees to 1300 degrees**. During subsequent intense volcanic eruptions, the crystals of diamond would have been carried to the surface by magmatic rocks (a mixture of molten or semi-molten rock), later termed Kimberlites.

The diamond is more than just aesthetically beautiful—it's an enduring symbol of love, romance, and commitment. The diamond's rarity, beauty, and strength make it a fitting symbol of the resilience and longevity of marriage. In addition to engagement rings, diamonds are traditionally given as gifts to commemorate the milestone of the sixtieth anniversary. With their rich history, sense of permanence, and lustrous brilliance, diamonds are a natural choice to signify a lasting union.

Kohinoor diamond that was probably mined from Golconda mine of India, is one of the most famous Diamonds in the world, is now part of British crown jewels.

4. Laxmi:

As per **Samundra Manthan** story **Laxmi** is offered to **Visnu** who accepts her as Consort. In Hindu religion, **Laxmi** is treated as the Goddess and considered as the symbol of Wealth, love and prosperity. Due to her emergence from ocean, **Laxmi** is called sindhu-suta (daughter of ocean).



Figure-1, Image of Goddess Laxmi

Gold representing Laxmi, its probable origin

More than actual image of **Laxmi**, the various **Gold** ornaments worn by the Goddess **Laxmi** are the center of attraction for many persons. Gold is found in nature as a virgin metal, has been used as a symbol of wealth by all Noble/rich, powerful, influential people since ancient times. Hence from practical point of view, **Gold** can be considered as the true representative of **Laxmi**. In India, **Gold** ornaments form the important constituent of Marriage ceremony. Many Indians buy Gold on several auspicious occasions just for investment. Also every country wants to have sufficient **Gold Reserves** so that at the time of economic difficulty, it can be sold in the international market. As the yellow metal has no problem of liquidity, and with the possibility of value appreciation, it has become an attractive instrument for doing investment for both affluent as well as poor class people.

Gold is a precious metal, has been used as the medium of transaction in the past in the form of coins. Its atomic number is 79, and density -19.3 gm per cubic centimeter. The peculiarity of Gold is chemically almost inert, and doesn't want to bond with other elements. But the fundamental question is where from Gold reached the Earth surface?

There are different versions about its origin. Some researchers say that it came to the Earth's surface from the deepest regions of our planet. Some scientists profess that most of the elements found on Earth have cosmic origin, popularly called as "star stuff". It is generally believed that about **14.6 billion years ago, during the Big Bang**, only three elements were formed: hydrogen, helium, and little lithium. A few hundred million years after the Big Bang, the earlier formed stars were blazing away with their nuclear fires. It is also said that most of the heavy metals (heavier than iron) including **Gold** would have been produced in space, inside the stars through a process called nuclear fusion or collision of neutron stars or Supernova explosion. The production of heavy elements takes place mainly through what astrophysicists call rapid neutron capture process or "r-process nucleosynthesis" (**r** stands for rapid). Neutron stars are the collapsed cores of stars that have exploded in a supernova. About 200 million years after

the formation of our planet, through a long duration meteoric shower that periodically bombarded the Earth for nearly 2 billion years, Gold would have arrived on the Earth in a small quantity but in a phased manner. It is very true that the Earth formed from the same cloud of matter that formed the Sun, but the different planets present in our solar system would have acquired different compositions through the process of formation and evolution, and also due to frequent attacks of celestial bodies such as Asteroids on our solar system.

In summary, although **Gold** is found in a small quantity in a native form on the Earth-crust, but it is generally believed to have come from **Space** where it would have been born through the process of **nucleosynthesis** much earlier to the formation of our Solar System, and the celestial bodies like **Asteroids** would have brought it to our planet during its early phase of developments.

5. Shankha: A conch given to Vishnu.



Figure 2a, a shell



Figure-2b, Molluscs and shells

Sea Snail as Shankha Maker

Shankha is one of the main attributes of **Visnu**. Shankha/Shell is actually the spirally coiled enclosure mostly made up of Calcium Carbonate material formed due to secretion of the Snails. Snails are a very large group of animals found in saltwater, fresh water and on land as well. Snails are commonly termed as **Molluscs**. Latin word molluscus, meaning "soft". Molluscs include some familiar creatures as clams, oysters, snails, and octopi, limpets, chitons, and many more.

Sea Shells are commonly found on the beaches due to washing up, but the common people do not pay attention to their makers. Since many sea shells are very attractive and durable, they have been used by humans to make necklaces and other jewelry from prehistoric times to the current day.



Figure-3a, Common Land snail



Figure-3b, Different shapes of Shells of Molluscs

Molluscs are the invertebrate animals, the largest marine phylum, and also one of the highly diverse animal species presently found in the world.

Some experts believe that **Molluscs** were present during the period earlier to **Cambrian Period (Cambrian Period- 541 to 485 million years ago)**. Earlier to them, probably, some species of the **Sponges** (Marine animals) would have been existing in the oceans, but remained unnoticed to the human beings for a very long period as they lived deep in ocean.

6. Dhanvantari: In legend, described as a divine physician of Gods, believed to be the incarnation of **Visnu** comes out of ocean at the last holding **Amrit-Kalasha**, a pot of nectar during the process of churning. But in the present article, the event is considered as the appearance of the sixth jewel, and not fourteenth ratna/object which is mainly based on the **logic of process of evolution**. It can be termed as a *watershed moment* in the **Samudra Manthan** process.

Dhanvantari as the transporter of living beings from Ocean to Land

In the **Samudra Manthan** story, **Dhanvantari** is depicted as the carrier of Amrit/Nectar to the Gods and the demons. In the present part, **He** has been projected as the conveyor of the earliest forms of life (both plant and animal) to the Earth that was originated and got diversified in marine environment much earlier. The photographs given below would explain the logic behind the choice.



Figure-4a, **Herbs** in lower left hand



Figure-4b, **Leech** in lower left palm

Above figures are the two separate artistic illustrations of **Dhanvantari** that are based on the description available in two different stories of **Samudra Manthan** incidence. Figure-4a depicts **Dhanvantari** holding **Herb**/medicinal plant in his lower left hand (encircled by magenta colour circle), and Figure-4b shows presence of a **Leech** on his lower hand palm. The following paragraphs mainly focus on the origin of plant and animal life in the marine environment from the **Life Science** perspective, but purposely excluded presence of **Amrit-Kalasha** or a pot containing nectar in the hand of **Dhanvantari**. Aspect of nectar has been taken care of separately under the question, “**What could be real nectar of the story in the present context?**”

As it is said that Life on Earth would not have been possible without the evolution of plants on land. It is also believed that water played a very crucial role in supporting early life in absence of oxygen, but presence of ultraviolet radiation, and then evolution, diversification and sustainable of subsequent living species in an ocean and

land. This is because earlier, when there was no oxygen means no protective layer of ozone in the Earth's atmosphere. Some bio-scientists state that there would have been early life in the form of micro-organisms on the land as well way back 3 billion years ago that later on got transferred to water, but many disagree with them and believe that the earliest micro-organisms would have formed from **Amino acid** in the marine environment itself.

Origin of plant life in ocean and on land

It is generally agreed by many evolutionists that the life began on earth in the form of a single cell somewhere between 3.5 to 4 billion years ago. The earliest unicellular micro-organisms are identified as the **Prokaryotes**. They are the ancestors of modern bacteria. About 1.6–2.7 billion years ago, these micro-organisms got diversified to unicellular but different organisms having nucleus enclosed within membrane and are termed as **Eukaryotes**. The next major change in cell structure would have occurred when bacteria were engulfed by Eukaryotic cells. Then came the **Cyno-bacteria** who could obtain energy through the process of **Photosynthesis**. Due to their capability to generate Oxygen via photosynthesis mechanism, the Cyno-bacteria, which are Prokaryotes, are also called "blue-green algae". After some period, another engulfment would have led to the formation of the new organisms containing **Chloroplasts** first in the form of **marine algae** that became the very basis for subsequent evolution of the plant kingdom. The uni-cellular to multi-cellular transition would have occurred anytime between 835–542 Million Years Ago (mya), also known as Ediacaran Period in terms of Geological Time Scale (GTS) in a multiple but independent events. Thus starting from 3.5 billion Years ago for about next 3 billion years, most of the organisms were microscopic, and bacteria and archaea were the dominant forms of life in Ocean. It means, the major diversification of organismic structure appears to have taken place in the last 700 million years that produced variety of species of the plants and the animals seen on Earth.

Today, microscopic organisms are found in every part of the biosphere. But the plants and fungi would have been the prominent life-starters on the land about 500 million years ago. This could have happened when water from ocean got forcefully splattered on the adjacent land and some diversified micro-organisms, and early species

of plants like **Green Algae** would have got thrown out of ocean in the form of tidal waves, but somehow survived at the edges of fresh water bodies present around ocean. From here, life on land would have begun first in fresh water, and then on proper land surface through the path of evolution by creating totally new species of the plants that would produce energy through the process of **Photosynthesis** but survived in early hot and humid atmosphere prevailed at that time on earth. Direct exposure to sunlight, and practically living in a almost dry or waterless surrounding would have taken a long time for the early plants to get adjusted with. Therefore, the development of **Adaptability** to a new environment as an entirely new capability for facing real challenges was the crucial factor for survival and sustainable of early plant life on our planet. Transition of early land Plants like Algae (Charophytes) to other land based plants like **Mosses** to **Pine tree** would have occurred through the several diversification stages during 500 to 450 million years ago (mya) that has been explained in brief below.

Figure-5a, Mosses:

It is said that ancestors of today's mosses would have been some of the early plants lived on land as early as 450 million years ago. Fossils of present-day Mosses have been traced to the **Permian Period** (298 to 250 mya). Mosses would have covered the land surface in the form of Mats or Carpet for several thousand years.



Figure-5b, Ferns:

Fern belongs to vascular group of plants. Earliest fossils record is available from the **Devonian Period** (410 - 355 million years ago).

Fern species live in wide variety of environment, including near water bodies, cold mountains, deserts and open field as well.



Figure-5c, Gymnosperm Plants:

These are the Seed Producing Plants, that includes conifer, ginkgo, Cycclades etc. They produce non-cased or naked seeds and hence called as "gymnosperm".

It is widely accepted that the gymnosperms originated in the late “ Carboniferous” Period around 320 mya or probably earlier to that, during Devonian Period.



The earliest plants like, mosses, liverworts, horn-worts, ferns, conifers etc who established themselves from nowhere on land through the mechanisms of **Alteration** and **Adaptation**, did not have to compete for water, land, minerals, also did not have to worry about the attacks from herbivorous animals. Hence, “no or the least competitive environment” would have caused rapid diversification, massive growth, and spread of the plant Kingdom during the Cambrian and Devonian periods. Thus, early seed-bearing plants like conifers came to existence on land through the several jumps of evolution starting from green algae.

Origin of Early Animals on Land

As mentioned earlier, **Sponge** would have been the earliest proper marine animal present during Pre-Cambrian Period (650 to 545 mya). **Molluscs** (Shell makers) would have come into existence after Sponge. Both **Sponge** and **Mollusc** are the earliest known invertebrate (have no backbone structure). **Fishes** are generally accepted as the earliest known Vertebrates. It means to say that whether invertebrate or vertebrate, both types of animals evolved in ocean.

Now coming back to the picture of **Dhanvantari** holding **Leech (Jaluka)** in his lower left palm. **Leech** is a worm like parasitic animal has soft, muscular, segmented body that can get lengthen and contract. Hence, there exists some similarity between **Leech** and **Mollusc** (shankh or shell maker). Similar to Molluscs, leeches are found in fresh water, marine water, and on land as well. But a Leech can kill a Mollusc for

survival. From evolution point of view, Earthworm is a close relative of Leech. Leech therapy is an ancient method of treating illness and diseases all round the world. In some countries, in modern-time also, Leech spas are present at some places to do Blood-letting.

Figure-6, Leech sucking blood



Some researchers say that Leech would have got evolved from the Oligochaetes species about 500 - 450 mya. Hence, there is a strong possibility of transfer of either Leeches or Molluscs or both, some time between 425 to 400 mya from marine water to land, first to fresh water reservoirs, and then splashed up of modified species from fresh water to land surface from whom other land based invertebrate animals would have got originated.

Summing up, **Dhanvantari** appearing from churning of ocean holding a **herb**/plant in left his hand can be taken as transition of plant life from marine environment to land-based atmosphere. Similarly, presence of a **Leech** on his left palm can be considered as transfer of animal life from ocean to land surface. The earliest transfer of plant life from ocean to land could have occurred probably during the late Cambrian Period (500 to 450 mya), and animal during the Devonian period (about 400 mya). In this way, coming up of **Dhanvantari** from ocean of milk can be symbolically taken as the beginning of plant and animal kingdoms independently in a phased manner during the period of about 100 million years starting from 500 to 400 mya.

7. **Parijat:** the divine flowering tree with blossoms that never fade or wilt, taken to Indraloka by the Devas/Gods.

Parijat representing a class of Flowering Plant

As mentioned elsewhere, **Gymnosperms** are those plants who produce naked seeds, and got evolved from earlier plants some where between 350 to 300 mya. But they do not bear flower at all. In Botany, **Angiosperm** term is used for the flowering plants. The ancestors of flowering plants diverged from gymnosperms about 245 to 202 million years ago (mya). By 120 mya, **Angiosperm** a new class of plants got diversified extensively and became widespread by 100 to 60 mya. The evolution of the earliest seed plants/gymnosperm and later angiosperms appears to be the result of two distinct events of different periods. Angiosperms are vascular plants. Unlike Gymnosperms such as conifers and Cyclopteris, angiosperm's seeds are found in a flower. Angiosperm eggs are fertilized and develop into a seed in an ovary that is usually in a flower. The flowers of angiosperms have male or female reproductive organs. Today, they make up around 80 percent of all the living plant species on Earth.



Figure-8, **Parijat or Night-flowering jasmine**

The most beautiful thing about the Angiosperms is, they attract Animals like birds and insects who act as the **pollinators**. When insects and birds try to suck nectar out of a flower, they pick up some pollen as they move from flower to flower, and also can leave some pollen behind. Wind can also help movement of pollen from one flower to another. Thus, flowering proved to be an unusually effective means of reproduction, spreading (whatever its origin) to become the dominant form of land plant life.

Flowering plants, over a period of time, would have definitely facilitated diversification of some species of winged insects such as Butterflies, several types of Bees, Dragonflies etc who regularly look for nectar available in the flowers. The origin of insect wings is still a highly debated mystery in biology. Some say that flying insects got evolved around 400 million years ago.

Based on existing morphological changes, some scientists say that **Birds** would have got evolved from **Dinosaurs**, but many contest their claim and believe that the birds could have got diversified from the **Reptiles** sometime between 120 to 100 mya or even later time (80 to 60 mya).

8.Kalpa-vriksha: a wish fulfilling tree that sprung from Samudra Manthan process and given to Gods.

Fruit Bearing Plant as Kalpa-Vriksha

In India, **Coconut** tree is called as real **Kalpa-Vriksha** of **Samudra Manthan** story as its each and every part is used by man for making many useful things. Coconut fruit is offered to God, regularly used for making spicy curries, and edible oil is also extracted from the dried coconut/fruit. In Botany, a fruit is considered as a part of flowering plant that covers the seeds with the special tissues. Hence a real fruit can be treated as a next step of the flowering plant evolution.

Earlier time, some locomotive insects, then flying insects, and early small birds were capable to get nectar from the flowers. As we see, many birds and animals whether herbivorous or omnivorous eat fruits for their survival. Therefore, in addition to provide **Shelter** to many birds, and some animals, the fruit bearing trees would have provided **Food Security** also to many living beings in the past. Hence, from the usefulness point of view, the **Fruit Bearing Trees** can be considered as factual **Kalpa-vriksha** of the story. Mutual dependence of the plants and the animals would have surely aided survival, reproduction, co-evolution, and spread of their offspring to the different locations in the past.

9. Ucchasravas : It is seven headed white horse taken by Indra, the king of Gods

Origin of Horse

Horse is a mammal, seen as a symbol of power, strength and agility. Evolution of Horse has been extensively studied by many in the past, and most of the researchers believe that the Horse would have got evolved about **55 million years ago** from a small wild animal like dog or fox but over a long period of time, through several morphological changes, present-day Horse would have come into existence. Actually, an evolution of living thing is like a branching tree, without any predetermined target, but can occur through genetic variation, natural selection, genetic drift, and specialization.

10. Airavat : A white elephant given to Indra

Origin of Elephant

It is believed that about **35million years ago**, today's **Elephant** species would have got evolved from **Proboscideans** whose roots could have been current day **Pig**. It is also said that about 50-60 million years ago, the ancestors of the modern elephant would have occupied a variety of extreme environments; this includes from tropical rain forests to deserts in both low and high altitudes.

11. Kamadhenu : A divine mother cow, that fulfills owner's wish. As per story, it is given to Visnu, who granted to the Sages so that its milk and ghee can be used by them as the sacrificial items while performing Yajnas.

Cow representing “Kamadhenu”

It is believed that members of the **Bovidae** family such as cattle, bison, water-buffalo, gazelles, antelopes, sheep, goats, wildebeests etc would have got evolved around **20 million years ago** from a common ancestor. Cows are found in many parts of the world, but in India they are treated as the sacred animal. Holy Cow's milk, dung, urine are used by Hindus in various social functions and festivals.

Note: As far as the order of evolution is concerned, among the three aforementioned domesticated but herbivorous animals/mammals, Horse comes first, then Elephant, and finally Cow. But from the domestication of animals point of view, Cow stands first, then comes Horse, and an Elephant tamed at the last. As all three are animals are the grass eaters, it is clear from the evolution theory that some varieties of Grass evolved much earlier to these animals, probably around 65 to 50 mya. Researchers say that around 35 mya, Earth climate would have become cooler and drier, and due to the development of grasslands in different continents, grazing mammals would have become widespread.

12. Varuni or Sura : the goddess of wine, given to Asuras who accept her reluctantly.

Varuni/Sura as the Early Woman

In biological term, Modern Man is called as ***Homo Sapien*** means “ Wise Man “ in Latin, is actually said to be evolved in **Africa** within the past 300,000 years (or 200,000 ?) from the Primates/Apes who are considered as the ancestors of human (it is said that chimpanzees are the closest living relatives of Man as both share almost 98% of genes).

“**Out of Africa**” theory is the most widely discussed in the International Life Science forums informs us that the earliest human fossils found in Africa are that of **Homo Sapien**. Model proposes single origin of all human races presently seen all over the world, and intimates that the earliest batch of human would have left **Africa** between 80,000 to 60,000 years ago. Although there is no unanimity among the various Evolutionists or Archaeologist, or Genetic Scientists about the single origin of human, still it is generally believed that Modern Man has his roots in Africa. Some believe that **Archaic human** would have first left **Northern Africa** as early as 130,000 or 115,000 years ago and then, **Homo Sapien** in the recent wave around 70,000 years ago. Some researchers who believe in Multi-Region Theory, say that Modern Man probably interbred first with **Neanderthals** in west Asia or Europe, and then some time later a group interbred with south eastern Asian people called as Denisovans.

What ever be the real story of evolution of human beings, one thing is clear that Modern Man due to his capability to adapt to the various environments, first migrated out of Africa to different locations, and in the last 40,000 years started living in the Deserts, Rain-forests, Mountains, and the coldest Arctic region as well covering almost all landmass but developed distinct physical aspects (races) right from colour to appearance due to a very longtime living in different geographical areas, where his morphology got diversified through the processes of genetic drift and natural selection. In short, a longterm geographically separation and mutation of genes has resulted in existing variations in the human beings.

Now going back to **Samudra Manthan** story, based on the model of African origin of all humans, it can be safely assumed that **Varuni/Sura** represents **Early Woman** who would not have been so good looking in present context, having dark complexion, short and curly hair on head, and also without sharp anatomical or facial features as seen today. Probably, that is why the composer of the story has mentioned that **Sura** is given to **Asuras**.

13. Apsaras : Beautiful divine nymphs taken by Devas (Gods).

Apsara as present-day Beautiful woman

Here, **Apsara** is considered as a beautiful woman, having fair complexion and sharp facial features.

As discussed earlier, over a period of time some important anatomical or morphological changes in man would have occurred in the past through the process of evolution as he has been living in different regions of Earth since 40,000 years. The process of evolution involves a series of natural changes that cause species (populations of different organisms) to arise, adapt to the environment, and become extinct in some cases. All species or organisms have originated through the process of biological evolution. In animals that reproduce sexually, including humans, the term species refers to a group whose adult members regularly interbreed, resulting in fertile offspring capable of reproducing leading to extension life. Evolution occurs when there is a

change in the genetic material; the chemical molecule, DNA- which is inherited from the parents, and especially in the proportions of different genes in a population. Genes represent the segments of DNA that provide the chemical code for producing proteins. Information contained in the DNA can change by a process known as **Mutation**. Genes affect how the body and behavior of an organism develop during its life, and that is why, we see different human races populating separate regions of the Earth.

There are 22 chromosome pairs and two sex chromosomes in humans. Females have two X chromosomes; males have an X chromosome and a Y chromosome. The X chromosome is significantly longer than the Y chromosome and contains hundreds more genes. Because the additional genes in the X chromosome have no counterpart in the Y chromosome, the X genes are dominant. This means that almost any gene on the X, even if it is recessive in the female, will be expressed in males. DNA study intimates us that there are two sets of DNA, one set is of the male sex chromosomes Y, which is passed from father to son and never recombines with its partner the X- chromosome (X-chromosomes do recombine in women), and second set as mitochondrial DNA, that is found outside the nucleus in organelles called **mitochondria**. Genetic Science makes it clear that our genomes are actually a combination of DNA from both our mother and father. However, mitochondrial DNA (**mt-DNA**) comes solely from our mother. This is because the female egg contains large amounts of mitochondrial DNA (mt-DNA), whereas the male sperm contains just a tiny amount. The sperms use their small amount of mitochondria to power their race to their egg before fertilization. Once a sperm merges with an egg, all the sperm mitochondria are destroyed.

Based on evidence gathered by the Genetic Scientists, it is generally professed that all humans are originated from a common female ancestor approximately 160,000 years ago. This hypothetical female ancestor is sometimes known as the '**Mitochondrial Eve**'. Similarly, scientists say that all male humans apparently share a common Y-chromosomal DNA, and hence have a single male ancestor who probably lived 60,000 years ago, sometimes called the '**Y-chromosomal Adam**'.

Above exercise has been done just to impress upon the readers that it is the **Dominant Female DNA** (as '**mt-DNA is inherited maternally/ Mitochondrial Eve**')

that would have carried forward or transferred the major evolutionary changes from one generation to other in the human beings.

Now looking back to **Samudra Manthan** story, practically speaking, character **Apsara** can be taken as an **evolution of a beautiful woman** from earlier awful or unattractive or unpleasant or bad looking woman represented by **Varuni/Sura**.

If we try to analyze woman psychology of the last 100 years, we find that every woman, what ever be her complexion or her financial status, wherever she might be living, but one thing is clear that she wants to present herself in the best possible way. It means to say that a woman has **natural inclination** to look beautiful. Every one wants to look at a beautiful woman, talk to her or about her as she automatically becomes a center of attraction. In general, her face becomes an identity of her beauty. Though Beauty is said to be just skin deep, but it does make a difference both literally and figuratively.

In modern day, some women undergo several cosmetic surgeries to achieve what is known as a perfect figure or bodily symmetry to look physically attractive. Today, many women extensively use cosmetic and beauty products to improve their appearance. Cosmetics have been in use for thousands of years. Since early days, women have been using flowers and shells to decorate themselves to look pretty.

In fact, men too are on the forefront to make the women look gorgeous. There are many dedicated men who work as the hair-dressers, fashion designers, ornament or jewelry designers, cosmetic surgeons, make-up artists, shoe designers, hand bag designers etc and have made immense contributions in the Fashion Industry through their innovations. Since ancient time, it is said that beauty of a man lies in his braveness/gallantry, and braveness/valor of a woman lies in her beauty.

In other words, in all probabilities, it is woman's **natural instinct** or **natural selection** or **impulsive force** or a very strong **internal drive to look stunning (Apsara)**, that would have brought change in a look of all human beings from earlier Homo Sapien. On several occasions, it is said that, a woman is behind the success of a man. But Genetic Science has revealed the fact that it is **natural instinct** or **inherent quality** of a woman (probably impact of **Mitochondrial Eve**) **to look spectacular or sensational or attractive** that has led to creation of present look to all gents. Hence, all men wherever

they live today, must be thankful to the womenfolk of that region for their physical appearance.

14. What could be real nectar of Samudra Manthan story in the present context?

In the original story, **Dhanvantari** comes out of ocean of milk at last, holding a pot of Nectar/ Amrit Kalasha in his hand. It practically means, **Amrit/nectar of immortality** was already existing in **ocean**, but it was brought out by **Dhanvantari**.

From providing life support to all living things point of view, **Oxygen** is the only candidate of nature who could fit into the criterion of **Amrit**. It is well accepted by most of the evolutionists that there was no free oxygen present in the early atmosphere of Earth when it was formed about 4.54 billion years ago (hydrogen and helium were the main constituents of the earliest atmosphere). In the marine environment, as life got evolved from a single cell to multicellular micro-organisms, and then diversified from oxygen generating cyano-bacteria (probably well before 2.4 billion years, **cyano-bacteria** started producing free oxygen through photosynthesis process) to algae to other marine plants, various oceanic elements first consumed freshly generated free oxygen (example- **Banded Iron Formation**), and when ocean got saturated with free oxygen, then it slowly started releasing the same to the earth surface.

Most atmospheric scientists believe that until about 2.4 billion years ago the concentration of atmospheric oxygen was insignificant, but increased slowly with time when early living species started producing oxygen via photosynthesis. Around 750 to 650 million years ago, when the Great Oxygenation Event (GOE) occurred, that really

caused major change in oxygen content of Earth's environment.

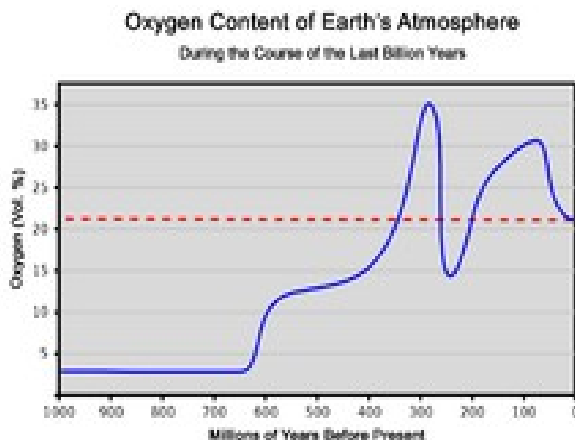


Figure- 9, Change in Oxygen content of Earth's atmosphere in last billion years

In the last 600 million years (see figure-9), due to growth of marine plant life, more amount of oxygen got released in atmosphere. The increased oxygen concentrations provided a new opportunity for further Biological Diversification. In true sense, “origin of oxygen in Earth's atmosphere has to be credited to one thing i.e. **Plant Life in Ocean**”. Even today, marine plants are the major contributors to the atmospheric oxygen.

But the drastic jump in atmospheric Oxygen content occurred when Marine Plants arrived on Land. This is the **turning point** in the process of evolution of life on earth surface. **Dhanvantari** coming out of ocean of milk in **Samudra Manthan** story, can be symbolically construed as a transfer of life from water to land. **Oxygen** may be taken as **nectar**, and **Plant**, being real source of oxygen, as a pot or Amrit Kalasha.

Still a question of **Immortality** remains to be answered. The transfer of **Genes** by all living things from one generation to other, through a cycle of reproduction can be seen as the **symbol of Immortality**. A living thing remains in the world after its death in the form of its offspring. In this way, “**Life moves on....**”

Note: Please read **Appendix “A”** to know other aspects of **Samudra Manthan** Story.

B. Decoding Management Principles from Original Samudra Manthan Story:

Original **Samudra Manthan** story tells us how an imagination or theory has been put into practice to achieve the desired goal. It definitely provides direct clues about the systematic ways of handling or managing a large scale programme or a task involving many activities. Some Management Principles derived from the story that are applicable to modern-day business world are given below.

Some tips for present day Managers :

1. A negligence or a unnoticed mistake of a main Leader can annoy someone:

A story begins with **Indra** king of Gods, once traveling on a elephant comes across Sage **Durvasa** who gifts a special garland given by Lord **Shiva** to former. But

Indra keeps the garland on a trunk of his elephant. As its smell irritates the elephant, who in turn throws garland on ground and then crushes the same under its foot. This act makes **Durvasa** very angry, and then he curses Indra and all Gods to loose all strength, energy, and wealth they posses.

In other words, a true leader needs to take even a small thing brought to the notice by any customer (customer complaint or feedback), or a suggestion given by any stake holder of business for its improvement or an observation made by a well wisher or an incidence reported by the onlookers like media persons very seriously. Timely corrective action can prevent further damage to the business and future downfall in a market share.

“A stitch in time, may prevent nine”.

2. Casual approach to an early warning may lead to downfall of an organization:

Subsequent to the curse of **Durvasa**, when Gods start loosing battle after battle to Asuras, that also depletes their strength, then **Indra** realizes that something needs to be done to tackle the unforeseen situation. Earlier, Gods do not pay attention to curse of **Durvasa**, and therefore, they land in trouble and end up as the looser.

It means to say that an early warning signal coming from any quarter of business, if not viewed seriously, then it can do major damage to your business interest. A casual approach or an intentional neglect to any threat/warning may lead to loss of business.

“Be alert to safeguard your interest”

3. Drive to solve a problem can compel the leaders to go for Consultation:

After doing failure analysis, when Indra and Gods come to the conclusion that **Durvasa's** curse is the main cause for their defeat at the hands of Asuras/Demons, then they sit together and start thinking about how to overcome the newly cropped up problem. Having realized that no one from them is capable to resolve the issue, they jointly decide to consult an expert. First they go to Lord **Bramha**, who promptly tells

them **He** is not a right person to give advise, but asks them to approach Lord **Visnu**. After listening to Gods carefully, **Visnu** suggests them to get ready for **Samudra Manthan** as it can only provide them **Amrit** or **Nectar**; a proper solution to existing problem.

After experiencing set backs in business, a systematic failure analysis is essential to establish a link between real cause of failure and its ultimate effect. If needed, one should not hesitate to consult an expert.

“Only a capable expert can show right path for solution”

4. Teamwork also means Joining hands with the rivals or opponents:

After taking consent from Gods, **Visnu** prepares a detail action plan of **Samudra Manthan** process, but in the beginning itself also makes it clear to all Gods that it is an uphill task, beyond their capabilities, and can not be accomplished without presence and active support of their arch-rivals Asuras/Demons. Accordingly, Gods approach Asuras, appraise them about complete action plan, its long-term benefits, and then request them to actively participate in the process of Samudra Manthan. Based on the confidence shown by Gods in them, Asuras express their willingness to join hands with Gods in the process. This incidence clearly underlines the importance of giving up an ego or supremacy to bring both parties together for a common cause.

It is interesting to note that many business houses, though compete with each other in business, do join hands to lobby with the Policy Makers or Ministries to derive some benefits or concessions right from getting land, loans, tax concessions, export incentive, and also for framing favourable rules and regulations. For example,- Builder Lobby, Textile Lobby, Liquor Lobby, Sugar lobby, Steel Lobby, and through Associations like Telecoms, Automotive, Airline, Medium and Small Scale Industry sectors etc.

“United we stand, divided we fall”

5. **Despite meticulous planning, an unexpected event does occur:**

Though there are several participants in the form of Gods and Asuras, **Visnu** is the Chief Executive Officer (CEO) of the **Samudra Manthan Process**. **Visnu** shortlist **Mandara Mountain** as a rod or stirrer and selects **snake Vasuki** as a rope to churn out ocean of milk. As per his plan, when **Mandara** mountain is being lowered/positioned into an ocean, an unexpected thing occurs. Suddenly, mountain starts sinking in ocean. This problem is not anticipated by an expert planner like **Visnu**. Probably, realizing shortcoming in **His** planning or a lack of foresight, **Visnu** puts himself in action, immediately goes down the base of the mountain in the form of **Kurma**/ tortoise, provides support from below, and thus able to save the situation going out of control.

This type of situation is quite common at the start of many new business activities wherein, a leader tries to implement the things in a copy book style or as per earlier plan prepared on a paper. While translating paper plan to actual working model, some unexpected problems do surface causing cost overrun, and time overrun. Here, role of the true leader comes in picture. It can be termed as a testing time of the leadership.

“A true leader is one, who leads from front, blames no-one for any mishap”

6. **Every new production process takes time to get stabilized:**

As per the story, **Visnu** as **Kurma** takes total load of **Mandara** mountain on His back, and successfully completes the task of lowering of a stirrer in an ocean. Then **Vasuki** as a rope, is wrapped around **Mandara** mountain in a spiral way, all **Gods** take their positions on one side of mountain holding tail of **Vasuki**, and all **Asuras** stand on opposite side holding **Vasuki's** hood. When actual process of churning begins by pulling **Vasuki**, rope apart/ in opposite direction, then it comes to know that **Mandara** mountain or stirrer starts shaking or wobbling. Having experienced the problem of instability in the beginning of process, God **Bramha** is requested to sit on the top of **Mandara** mountain, which in turn imparts stability to the churning process.

In the beginning of a new process, some unknown factor may disturb smooth start of a process. But with the help of some expert, a solution to the problem can be obtained.

“Teething trouble needs to be sorted out before it becomes head-ache”

7. Early substance that comes out of the process may not be liking of anyone:

Story tells us that, as churning of ocean progresses, **Halahala** or poison is the first item that comes out of the ocean. Neither Gods nor Asuras know what to do with the poisonous gas. When poison begins to spread everywhere, causing uncomfortable situation to carry out churning further, then finally, Lord **Shiva** is requested to do the needful. **Shiva** slowly consumes complete **Halahala**, first product of the churning process, and thus provides relief to all.

There are many industrial processes where poisons gases, heat, and dust are evolved regularly, creating uncomfortable working conditions for all. These types of situations are quite common in chemical, petro-chemical, cement, mining, power generation, metal manufacturing, stone polishing industries etc. These early process products may cause chronic health problems or even death of a person. Hence, in the initial or planning stage itself, the top management has to think seriously about the safe working conditions for all those who are directly involved in production or may get exposed to harmful substances while handling the same.

For example, in a coal based power plant, when coal is burnt to generate steam from water, a large quantity of poisonous gases like carbon-Di-oxide, carbon monoxide, dust etc are evolved first. These pollutant gases are released in an atmosphere by providing channels of suitable height, called as chimney. Electricity is generated only when a flow of superheated steam drives the turbine.

Nowadays, Waste management has become order of the day for the longterm success of many industries. Management needs to do advance planning to tackle the issue of proper working environment, and also for the prevention of damage to the surroundings.

“Safety of the workers and an environment shall never be compromised”

8. Success comes only after hard-work and patience:

In the beginning itself, **Visnu** sets the target to achieve Amrit/ nectar of immortality in front of Gods. But Amrit/ nectar does not come in the hands of Gods in very first attempt. Both Gods and Demons have to work hard, continue the churning

process as it produces several ratnas/ objects which are distributed among Shiva, Visnu, Asuras and Gods.

At last, **Dhanvantari** comes out of ocean (original story) holding a pot of Amrit in one of his hands.

In other words, to achieve a set goal, a team working in industry has to make constant efforts under a proper leadership, and needs to have patience as well. Also the management has to show willingness to share some profit obtained from the business activity, by way of giving Bonus to the employees, and dividend or even bonus share to the share holders.

“There is no shortcut to the success. Sharing and caring build the confidence”

9. Brain power is mightier than physical power:

When **Dhanvantari** emerges with a pot of nectar from ocean, immediately Gods and Demons start fighting with each other to grab the same. When a pot lands into the hands of Demons, Gods appeal to **Visnu** to bring back the pot to them. Then **Visnu** plays a card of **Mohini**, a beautiful and enchanting damsel, distracts Asuras; tactfully recovers amrit kalasha/ a pot from **Asuras**, then distributes Amrit/nectar among Gods/ Devas.



Figure-10, Artist's impression of Samudra Manthan

When we take a close look at the figure-10, we notice that Gods are holding a tail of Vasuki, but hood of snake Vasuki is in the hands of Demons. It means to say that Asuras /Demons have to bear poisonous gases exhaled by Vasuki and noise made by him due to pain. In other words, despite standing in an uncomfortable work-spot, continuously facing rough weather during the process of churning, and still giving their best for obtaining nectar, finally they are deprived of the Amrit. Surprisingly, when Asuras get hold of Amrit kalash by defeating Devas, then **Visnu** plays his trick and takes away the same.

In industrial world also, we often see that there is a fight between the management and the workers for wage hike, bonus, and other facilities. Workers always argue/complain that their company has earned profit due to their hard-work/sweat, but the managers are given maximum financial benefits. People who use brain, usually get better recognition in terms of monetary benefits and promotion/status as well.

“Dignity of Labour is not taken seriously in many parts of the world”

10. Visnu as a true leader:

One thing is very clear from the **Samudra Manthan story**, God **Visnu** is the actual master-mind behind the story.

As a real brain behind the story, **Visnu** is involved in everything, right from the early planning, proper execution, trouble shooting wherever necessary, achieving final goal of obtaining Amrit/ nectar to delivering the same to Devas/Gods.

In the story, **He** is not mere an advisor or a consultant, but as the Chief Executive Officer (CEO), or the Director of a Movie who gets deeply involved in every activity, also gets the things done the way he wants. In the beginning itself, he frankly tells Gods

that it is next to impossible to them to obtain Amrit on their own, asks them to approach Asuras for their active participation. This makes Gods to give serious thought over joining hands with their sworn enemy, Demons/Asuras, and finally decide to patch up with Demons for the cause of Amrit.

When **Visnu** sees that **Mandara** mountain starts sinking in ocean, he takes it to his strides, takes shape of **Kurma**/tortoise swims down below already sunk part of mountain to provide support, bears complete load on his back, and thus prevents situation going out of control. It means, he personally monitors all happenings.

At the end, when Gods request him to do something to get Amrit Kalasha from the custody of Demons, he becomes **Mohini** for this purpose, and sees to it that all Gods receive the dose of Amrit (customer focus).

In other words, as an able leader, **Visnu** effectively makes use of all available resources, including Asuras, arch rivals of Devas. At the same time, since Gods approach him for the solution to the problem faced by them in the beginning, he only focuses on well being of the Devas/Gods and not Asuras/Demons.

In technical term, **Visnu** is the **Prime Mover** of **Samudra Manthan Process**.

There are many consultants in the world who simply sit in the air conditioned rooms, and give suggestions without knowing ground realities. But **Visnu** is the leader who does not leave the Field, always available to address any issue/problem.

“Customer Satisfaction has to be the ultimate aim of a true manager”

Selected Questions pertaining to Samudra Manthan Story, and their Answers

Q.1: What could be the real meanings of Trinity/Tridevas **Bramha, Visnu, and Mahesh** of the **Samudra Manthan** story in the present context?

Ans: In Hindu Mythology, Bramha, Visnu/Vishnu and Mahesh/Shankar are treated together as Trimurti or Triple Deity or Holy Trinity. In the following paragraphs, these three legendary characters are explained on the basis of present-day available **scientific information** about their attributes. Life in this world is a manifestation of the three principles of creation, sustainable, and destruction. Hindu Mythology connects these three aspects as **Brahma** – The Creator, **Vishnu** – The Preserver, and **Shiva** – The Destroyer. It also means everything born in the world has its end.

Somebody has aptly expanded the word, **GOD** as given below.

G --- Generator (Bramha)

O---- Organizer (Vishnu)

D----Destroyer (Shiva)

Bramha in Legends



Figure -11, Artist's presentation of Bramha

Lord **Brahma** is the first god of the Hindu Trimurti/Trinity (Brahma, Vishnu, and Mahesh), **Brahma** is usually depicted as God having four faces sitting on lotus (chatur-mukha Brahma), has four arms, and every face is usually shown with a beard. It is

believed that He is the real creator all living beings/creatures of the world. Brahma is said to have created certain "beings" solely by the power of his mind and thought. These beings are called the mind-born sons of Brahma. He is also termed as the **svayambhu** (uncreated creator), the self-born first person.

It is also said that His four heads represent four Vedas. There are four arms holding up different objects like, akshamala (rosary), kamandalu and pustaka (book) and Lotus. Kamandalu is a water-pot.

Bramha in Present Context

As explained earlier, when there was no **Oxygen** available in the Earth's early atmosphere, and hence no **Ozone** layer to provide shield against dangerous Ultra-violet (UV) radiations received from the Sun, means there was little or no scope for the life on the Land (some researchers say that the anaerobic micro-organisms would have been present on the Earth surface as early as 3.5 billion years ago). But it is generally agreed and accepted by many that Actual Life began underwater in the form of a single cell, then diversified into multi-cellular things, and then oxygen generating cyno-bacteria to marine algae. In other words, Life actually progressed and prospered in an oceanic water. It also means, it is **Water** that protected early life from getting direct exposure to UV rays.

Please note that **Bramha** is also known as **Kanja**, means **water born**. In fact, in **Sanskrit language, Water is described as Jeevan or life. Therefore, in practical sense, Bramha** can be taken as "**Water**" itself. **Hence**, in all probabilities, **Water** can truly represent **Bramha** of the legends.

Now coming to the four heads of **Bramha**. Science tells us that there are four states of matter, and they are **Solid, Liquid, Gas, and Plasma**. Therefore, in real sense, four heads of Bramha can be assumed to be the four phases of water.

Solid : Water is existing on Earth in the solid state as Snow or Ice. Both North and South poles are largely covered with Snow. Below Zero/0 degree Celsius, liquid/ water becomes solid/snow. Even many mountains including Himalaya are laden with snow. During winter at many places in the world, where temperature falls below 0 degree Celsius, snow fall occurs.

Liquid: In the standard ambient pressure and temperature, **Water** itself is a liquid form of naturally occurring inorganic substance whose chemical formula is **H₂O**. Nearly 70% of Earth surface is covered with water, mainly in the form of Oceans or seas. Around 1.7 % of total water is present underground. Water is also known as the **universal solvent** for its ability to dissolve many substances and hence, also called as “**solvent of life**”. It is the most adequate phase for life.

Gas: **Water** is also available in the gaseous state as **water vapour** in the Earth's atmosphere. Water vapour adds humidity to air. In Coastal areas, we experience more humidity in air due to higher content of water vapours in it. In rainy season also, surrounding humidity goes up. When water is heated to around 80 to 100 degree Celsius, slowly it gets converted into vapour state, commonly known as **Steam**.

Plasma: It is the forth state of matter. As it is generally considered as a high temperature phenomenon, not very common at room temperature, but there are some cold plasmas as well. It is nothing but hot ionized gas consisting of approximately equal numbers of positively charged ions and negatively charged electrons. Above the Earth's surface, the ionosphere is a plasma and the magnetosphere contains plasma. Plasma is mostly associated with the **Stars** via nuclear fusion.

But during rainy season, when lightning occurs, water vapour present in air can instantaneously get converted into plasma. Also when water is heated above 2000 degree Celsius, it may behave like plasma.

The collective mass of water found on, under, and over the surface of a planet is called the **Hydrosphere**. The earliest forms of life would have appeared in water. Water is essential to photosynthesis in plants, and respiration in plants and animals. In this way, **Water** can be seen as fulfilling the role of **Bramha** of legends.

Visnu/Vishnu of Legend



Figure -12, Artist's impression of **Vishnu**

Vishnu/Visnu is one of the most popular gods of Hindus. He acts as a **preserver**, both creating order and keeping it on a worldly level. He is also viewed as a guardian of humans. He wears the auspicious "Kaustubha" jewel around his neck and a garland of flowers (Vanamala).

Vishnu is typically depicted with four arms and blue-gray or black coloured skin. In each of his four hands, he holds a different symbol that reflects something about him. First, he holds a **conch shell** named **Panchajanya** that symbolizes the sound "Om," the sacred word that supposedly was spoken to create the world. He also carries a **Sudarshan Chakra** or type of disk that emphasizes mindfulness, and a **lotus flower** to symbolize freedom and the beauty of life. Vishnu carries a **mace** named "Kaumodaki", which acts to symbolize strength, whether of the body or mind. Vishnu rides on the King of Birds, Garuda, who is an eagle.

Vishnu is described as the Savior, the Preserver, and the Protector of the world created by **Brahma**. As per belief, as a protector, he return to the earth in troubled times and restores the balance of good and evil.

Vishnu in Present Context

A traditional depiction is **Vishnu** reclining on the coils of the serpent **Anant** accompanied by his consort **Laxmi** massaging his feet, and **Bramha** sitting on a Lotus that comes out of naval of **Vishnu**. All are surrounded by the ocean of Milk.



Figure-13, **Vishnu** resting on Anant snake/Shesh nag, with **Laxmi** and **Bramha**

As **Vishnu** is depicted with a dark complexion, and his role as the sustainer of life takes him closer to the mother **Earth**, as till date life is known to be present on Earth only. Man is yet to get clinching evidence of life on other planets of our solar system.

In figure-13, **Bramha** is shown springing from Vishnu's **nabhi** (navel), hence, called as **Nabhija** (navel born). As explained earlier, **Bramha** is linked to **Water**. Water is available on the ground as oceans/seas/lakes, underground- we extract it by digging wells, and gas or vapour state in air. It means the **Earth** acts as **storehouse** for **Water**.

In above figure, Goddess **Laxmi** is shown gently pressing feet of **Vishnu**. **Laxmi** symbolizes wealth and fortune. It indirectly means that to obtain wealth, we need to nurture mother Earth properly. Earlier, it has been described that **Gold** represents **Laxmi**. In practice, all forms of wealth are obtained from **Earth**, whether Marine, Forest, Minerals or Agricultural produce. This also means Earth/Vishnu is the the real giver and

the provider of all the things needed for the survival of living things. It also proves that **Wealth** is closely associated with mother **Earth**.

Coming to Snake **Anant** or **Shesh Nag**, it can be interpreted as an envelop of atmosphere/**air/Vayu** surrounding the Earth. **Anant** snake is exhibited to have created an enclosure around **Vishnu**, and other features. Hence **Vaikuntha** becomes the **Biosphere**.

Vishnu has always been associated with economic activities. Along with secured and safe life, wealth generation and distribution are very much essential to enjoy the good things in life. From this point of view, **Visnu** is the controller of Earth and Atmosphere.

Shiva in Legends



Shiva is regarded by some as the supreme being and by others as forming a triad with Brahma and Vishnu. He is worshiped in many aspects: as destroyer, ascetic, lord of the cosmic dance, and lord of beasts, and through the symbolic lingam. His wife is Parvati. He prefers to stay alone on the icy mountains of Kailash, smeared with ash which is an indicator of what remains when everything destroys (soul), wearing leopard-skin and is commonly shown deep into meditation. As mentioned earlier, Brahma is the creator of living things, but Shiva has the power to destroy it, and so hence called the Destroyer.

Shiva's attributes are a snake around his neck, adorning crescent moon, a third eye on forehead, river Ganga flowing from Jata/matted hair, presence of Trishul or trident and Damaru or drum. He is as a dark-skinned ascetic with a blue throat, hence represents darkness. He is the first among the gods of this world, who made the world so that others could make the things in it. Energy is his name, and he moves through all things, never static.

Shiva in Present Context



Logically speaking, when legends inform us that Shiva adorns crescent of Moon, then it is crystal clear that Shiva has celestial presence and not terrestrial. As Shiva is shown sitting on the top of the mountain exhibits his withdrawal from day to day activities of the world. Therefore, Shiva can be seen as the only God who has cosmic or universal presence but wants to keep himself away from the routine affairs of the world/Earth. Shiva is also called as Mahadev (Devon ke Dev Mahadev), means God of all Gods.

Shiva's dark skin denotes his cosmic dimensions. As we know during day time, clear sky looks blue due to scattering of blue colour. Samudra Manthan story informs us that Shiva's throat is also blue. It also means, He lives up in the Akash/sky. Legends tell us that All Gods are originated from Him. In other words, whether Vishnu/Earth or Bramha/water, other two Gods of trinity have come to existence due to Mahadev only. In true sense, Shiva represents Cosmos or Space. As we hear from the teachers and elderly persons that Sky is the limit for doing any good thing. In mathematics, there is a phrase called, Limit tends to infinity. Some Astrophysicists say that the Universe is

expanding. It means, **Shiva**'s domain or **Universe** is yet to take finite shape and size. It also indicates Dynamic state of the Universe. Through his **Tandava Nritya/ cosmic dance** in Space (celestial activities occur due to his dynamic behaviour), **Shiva** keeps shaping the new things (creation of new stars through supernova), and destroying some old features (death of a galaxy or the Stars). One way of explaining the emergence of river **Ganga** from his **Jata** can be taken as creation of a new **Akash Ganga** or **Galaxy** from his thoughts. Other way is, river **Ganga** starts flowing due to melting of glacier when Sunlight with sufficient intensity from Shiva's domain hits the Himalaya mountain.

Scientists say that about 65 million years ago, a large chunk of asteroid would have hit the Earth causing destruction of many living beings including **Dinosaurs**. It means to say that, the destruction of life on Earth can occur when a large size heavenly body from **Space** collides with Earth or even when the Earth goes near the Sun or a powerful star comes closer to our solar system (analogy to third eye of **Shiva**). All these things manifest probable interference in future from Cosmos or outside the present world would cause destruction of life on Earth. Therefore, from this angle, **Shiva** can be seen as the **Destroyer**.

In this way, from practical considerations, **Pancha-Mahabhutas** or **five elements of Nature** can be divided among the three important Gods of Hindu Mythology, that is explained as under.

Bramha: Aap/Water (Early Life on earth is originated and sustained in water)

Vishnu: Prithvi/Earth, and Vayu (Oxygen in Atmosphere/Air and start of life on Land).

Shiva: Akash/Sky or Space, and Tej/Sun (probable destroyer as occurred to **Dinosaurs**)

Q.2: What all geological activities that occurred in the past could be linked with **Samudra Manthan** story or the process of churning of ocean?

Ans: Samudra Manthan story tells us that by using **Mandara** Mountain as a stirrer in the ocean of milk, many Jewels/items are obtained. In the following paragraphs, we shall see how various continents, oceans and mountains are evolved due movement or churning of Earth.

The Earth's outer shell is basically consisting of seven (or nine ?) large scale and many small scale tectonic plates. The tectonic plates are in motion and it is thought that they have been in motion since the inception of Earth-crust.. The relative movements of the plates typically ranges from zero to 100 mm annually. The areas where these plates meet are known as plate boundaries. Two plates, where they meet keep exerting pressure on each others. Earthquakes and volcanoes are the direct result of the movement of tectonic plates at the fault lines. The term **fault** is generally used to describe the boundary between tectonic plates.

The periodical motion of the tectonic plates do cause most of the continental landmasses of the planet to collide with each other. These landmasses occasionally come together, to form a single landmass/ a giant continent known as Super-continent. In short, Super-continent means first making of a large single continent and then breaking the same into separate pieces or landmasses. There seems to be a cycle of super-continents that form and split up every 400 or 500 million years, driven by **Plate Tectonics**. The seven continents known us of today are really only a temporary arrangement in a long history of continental movement. Since formation of Earth, the landmasses on several occasion in the past have come together to become one, a new super-continent. After several hundreds of million years living together, all the continents once again got separated. Some of the super-continents include Columbia (also known as Nuna), Rodinia, and Pangea (or Pangea).

The last super-continent, the famous **Pangea** (see **figure-14**), formed around 300 million years ago and broke up about 100 million years later. **Gondwana** was southern part, and **Laurasia**, northern part of the **Pangea** super-continent. Our planet's landmasses finally moved to their current positions and will continue to move into the future.

The **Continental Drift** has created today's seven continents, and also divided earlier single natural water body surrounded **Pangea** into six different oceans and many seas (figure-15).

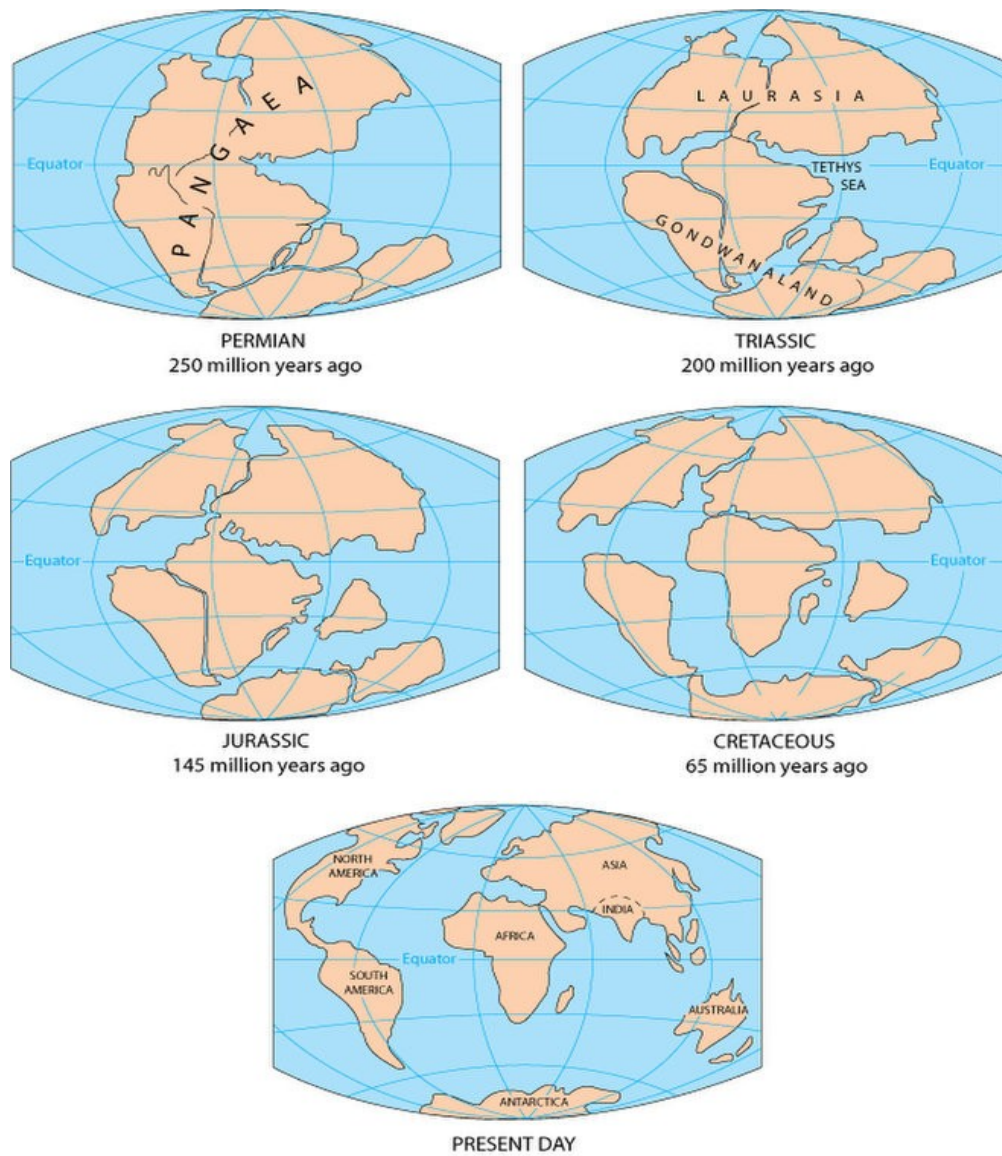


Figure-14, The breakup of the Pangaea super-continent.



Figure-15, Seven Continents and Six Oceans on Earth

Now we shall try to understand how the mountains are formed?:

Mountains are landforms which rise for over 600 meters than the surrounding land area. Many natural processes like folding, volcanic activity, faulting, metamorphism, etc, would have led to the formation of various mountains that exist today. But one common thing in them is that mountain creation takes millions of years. There are four types of mountains, has been explained as below.

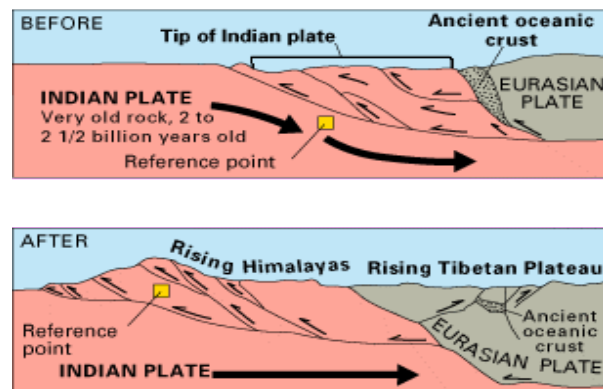
1. Fold Mountain: Fold mountains are the most common type of mountain. The world's largest mountain ranges are fold mountains. These ranges were formed over millions of years.

Fold mountains are formed when two plates collide head on, and their edges crumbled, much the same way as a piece of paper folds when pushed together.

Figure-16a, Fold mountain



Figure-16b, Formation of Himalaya



The upward folds are known as anticlines, and the downward folds are synclines.

Examples of fold mountains include:

- Himalayan Mountains in Asia
- the Alps in Europe
- the Andes in South America
- the Rockies in North America
- the Urals in Russia

The Himalayan Mountains were formed when Indian plate crashed into Asia and pushed up the tallest mountain range on the continents. In South America, the Andes Mountains were formed by the collision of the South American continental plate and the oceanic Pacific plate.

2. Fault-block Mountains : Fault-Block mountains are caused by faults in the crust, a seam where rocks can move past each other. Also known as rifting, this process occurs when rocks on one side of a fault rise relative to the other. Instead of the earth folding over, the earth's crust fractures (pulls apart). It breaks up into blocks or chunks. Sometimes these blocks of rock move up and down, as they move apart and blocks of rock end up being stacked on one another. The mountains are characterized by a steep front side which is in contrast to the sloping back side.

Figure-17, Fault Mountain



Examples of fault-block mountains include:

- the Sierra Nevada mountains in North America
- the Harz Mountains in Germany

3. Volcanic Mountains: The term volcanic mountains suggest that they are formed by volcanoes. When a tectonic plate subducts beneath another, magma is pushed to the surface. Once on the surface, what is now called lava gradually builds into a mountain. The mountain is made up of lava and piles of rock.

Figure-18, Volcanic Mountain



Examples of volcanic mountains include:

- Mount St. Helens in North America
- Mount Pinatubo in the Philippines
- Mount Kea and Mount Loa in Hawaii

Samudra Manthan story informs us that, **Sharanga** a divine bow, is created in ocean and given to **Visnu**. As we know, a bow is used to propel an arrow. Similarly, an active volcano throws out molten lava, dust and many gases into the atmosphere. From similarity in shape and functional point of view, a Volcanic mountain can be viewed as **Sharanga**, a bow handed over **Visnu** (part of Earth).

4. Dome Mountain: Dome mountains are the result of a great amount of melted rock (magma) pushing its way up under the earth crust. Without actually erupting onto the surface, the magma pushes up overlaying rock layers. At some point, the magma cools and forms hardened rock. The uplifted area created by rising magma is called a dome because of looking like the top half of a sphere (ball). The rock layers over the hardened magma are warped upward to form the dome. But the rock layers of the surrounding area remain flat. As the dome is higher than its surroundings, erosion by wind and rain occurs from the top. This results in a circular mountain range. Domes that have been worn away in places form many separate peaks called Dome Mountains.

In conclusion, formation of the Continents, the oceans, and the mountains are the outcome of the movements of the Earth's crust. The relative motions of the tectonic plates in current context can be taken as **Samudra Manthan Process of Hindu Mythology**.

Q.3: How could **Kurma-avatara** of **Visnu** be seen in the present circumstances?

Ans: In **Samudra Manthan** story, **Visnu** takes incarnation in the form of **Kurma** /tortoise to prevent sinking of **Mandara** Mountain. In other words, when mountain starts going down, to avoid its sudden descend, Visnu becomes **Kurma**, swims down and supports the mountain from below and **Bramha** sits on the top of **Mandara** for stability.

From geographic location point of view, Antarctica **continent** fits into the criterion of **Kurma**. **Antarctica** is the southernmost continent on the Earth. It is the coldest, windiest and driest continent. The word Antarctica is derived from the Greek word *antarktike*, which means “opposite to north” i.e., opposite to the Arctic. It contains the geographic **South Pole**. Out of the 14 million-sq.km area, 98% is covered with thick ice sheets that formed 25 million years ago and holds 70% of the earth’s fresh water. The average thickness of the ice sheet is about 1.9k m with the highest being 3.6 km near the pole. It is being speculated that complete melting of Antarctica's ice sheets would raise water level in oceans around the world by a few hundred feet causing submergence of some main cities and towns located on the sea coasts.

Figure 19a, Antarctica continent in red colour



Figure-19b, a view from down



Looking at a globe, Antarctica looks approximately centered on the south pole. The Earth wobbles as it spins. NASA Scientists have suggested that the loss of mass from Greenland and Antarctica's rapidly melting ice sheet could be causing the eastward shift of the spin axis. It means, critical location of Antarctica continent (south pole), and the presence of thicker Ice sheet as if **Bramha** (**Ice-solid state of water**) sitting on the

landmass (similar to Mandara mountain) are somehow responsible for present-day **rotational** as well as **ecological** stability of our planet. Due to continental drift, if the continent gets shifted to other location, or because of global warming Ice cover of Antarctica (also Arctic region and Snow covered mountains) gets completely melted out, then it would definitely cause disturbance to rotational and ecological stability of Earth.

Q.4: What does **Shiva-linga** represent in modern time?

Ans: The Shiva-linga is rounded, elliptical iconic image set on a circular base. It represents the most important Hindu deity, symbol of Lord **Shiva** which is placed in the temples to worship. Experts profess that the oval shape structure resembles the whole Universe and its circular portion resembles the base of Supreme Power which hold the entire Universe.



Figure-20, **Shiva-linga**

Different people interpret **Shiva-linga** in different ways. In the legends, **Shiva-linga** has been described as beginning-less and endless cosmic pillar (means **Stambha** as an infinite nature of **Shiva- Anadi** and **Anant**, means **no beginning** and **no end** as well) of the energy/fire which is originally a cause of all causes. Some visualize the presence of the ultimate and supreme lord in it , and hence **Shiva-linga** is worshiped by the many Hindu devotees as a symbol of energy and potential of God or as an abstract form of God. Skanda Purana depicts that the whole universe is created from the supreme **Shiva** and it finally gets submerged there.

According to some scholars, worship of Shiva-linga means worship of the reproduction function as they see it as the combination of **Linga**-Phallus, and **Yoni**-female organ of generation.

But using available scientific information, **Shiva-linga** can be expressed in terms of **zero** and **one** digits/figures that has been explained in the following paragraphs.

As we have seen earlier, Lord **Shiva** occupies the **Space/Cosmos**. Hence we shall begin with the definition of **Space**.

What is Space?

In scientific world, Space is defined as a **vacuum**, meaning a place where sound cannot travel due to absence of atmospheric molecules/dense medium to carry the same. In reality, we cannot say that there is total emptiness in Space as dust, gas, other matter including Galaxies, comets, asteroids, stars, meteoroids are always present in it. At present, no one knows exactly how big the **Space** is. Practically speaking, most of Space is relatively empty, meaning thereby, in relation to its size, there are some bits of dust and gas particles scattered here and there. Hence, on a very large or infinite canvas, Space can be considered as the vacuum environment. The concept of space is considered to be of fundamental importance to an understanding of the physical Universe.

Now look at the definition of **Zero**. **0** or **zero**, a mathematical element or a numerical digit means *Nothing* or *Nought* or *Nil*. It also means a **void** or utter **emptiness**. From gender point of view, **Zero** is considered to be Feminine Gender. Philosophically, Zero is also described as an universal Receiver or Acceptor of any thing. It means, **0** can accommodate anything in it.

In numerology, **0** represents, inclusiveness, wholeness, infinite possibilities,

Hence in a practical sense, **Space** or **Vacuum** can be indicated by **0/ Zero**.

Main Source of Energy in Space

Many religious persons, including some scientists, believe that **God** formed the universe through various physical processes and created galaxies, our solar system first, and then shaped the biological processes which brought life on Earth. The combine action of these processes then resulted in diversification of life through evolution mechanism.

This belief, which sometimes is termed "theistic evolution," is not in disagreement with scientific explanations of evolution. The Vedic philosophy explains that the universal or material creation is a matter of Divine arrangement.

Big Bang, the most popular theory states that around 14 billion years ago, our Universe came into existence from a “**singularity**”, from a infinitesimal small, hot **something** (?) by way of rapid expansion or inflation. But the model does not comment about origin or the cause of the dense and high temperature initial state of the universe. After cooling, the stars and galaxies were formed from the earliest formed elements i.e., **Hydrogen** in a large quantity, with some **Helium** and **Lithium**. It is generally believed that energy radiated by a Star throughout the year, comes from the so-called Hydrogen-burning nuclear reaction in which Hydrogen is converted to Helium, the most efficient natural process of energy creation. But nobody talks about what would have happened before Big Bang.

Scientists say that **Hydrogen** is the most abundant element in the universe, constitutes around **74%** of the matter of the universe. **Helium** comes second with **24%** matter of the universe. Other elements contribute just 2% of matter of the universe (this excludes Dark Energy and Dark Matter concepts).

Hydrogen is the simplest element consists of one Proton and one Electron but has no Neutron in the nucleus. As per mythology, in comparison to other Gods, **Shiva** though the most powerful, but lives very simple, ascetic life who applies ash over his body.

As Hydrogen contains only one Proton, its atomic number is 1/one.

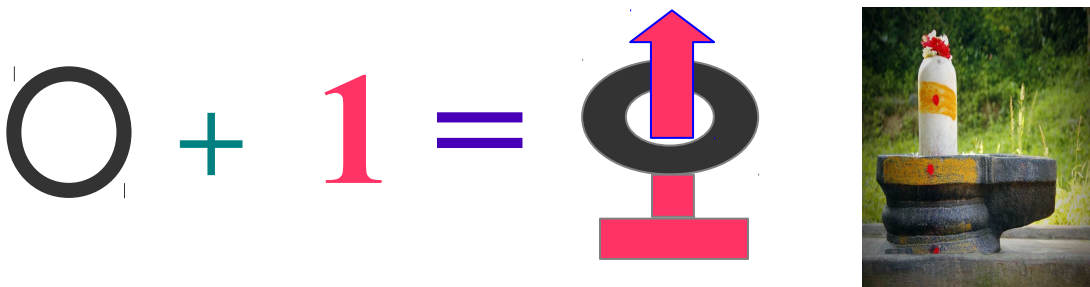
Now, coming to **1** or **one**. the number represents strong will, positivity, pure energy. It also indicates a new beginning. Additionally, it symbolizes oneness or unity, or God as an independent divine character (God is One).

In numerology, number **1** or **one** is self-determined and self-sufficient. It moves as per own activity plans, always has an urge to explore new things, but does not mind in living independent or alone. Nothing is needed for continued existence. It means a self-starter and self-sustainer too.

From gender consideration, number 1 or one belongs to Masculine gender. Philosophically, it is also treated as Donor or Giver.

Therefore, for all practical purposes, number one or 1 representing Hydrogen (as its atomic number-1) can be considered as the Main Source of energy in the universe.

Now, when **Zero** representing **Space** is added to **One** of Hydrogen (source of energy), then it becomes,



In this way, a combination of Space (**Zero** for vacuum) and Energy (**One** for Hydrogen-its atomic number is 1) as shown above forms **Shiva-Linga**.

In other words, Shiva-Linga is the Icon of Universe.

It is said that the first principle of the Universe is a feminine power, **Yoni** - **infinite hollowness** or **Space/womb** (**Aditi: celestial mother**). Then comes Energy, **Linga** indicating masculine power (**Shiva**). Thus, **Shiva- linga** is the union of feminine and masculine characters. It also represents **merging** or **disappearance** of **duality** into **one** or achieving **oneness** through **union**.

Note: **Boolean Algebra** is a mathematical logic that represents relationship between the entities, either ideas or objects, used to analyze and simplify the digital (logic) electronic circuits. It uses only the binary numbers i.e. **0** and **1**. It is also called as **Binary Algebra** or **logical Algebra**.

Final Comments:

When we take into account available scientific information, try to connect the naturally occurred events with the fantastic incidents reported in **Samudra Manthan** story, then in a nutshell, the story provides sketchy idea about the process of formation of Earth crust slowly from the molten mass, formation of early atmosphere, then beginning of life first in water, and start of evolution of some important categories of the selected species (first flora, later on fauna) and subsequent development of life on land including human-being that is seen on our planet today.

Additionally, story can also be used to explain some important Management Principles, formation of the continents, Mountains etc.

References:

As information from several general articles, handbooks, and research papers has been used to prepare the article, a list of references would be very lengthy, and hence not been given. For more information on each topic covered, the readers are requested to use Internet, Encyclopedia etc. All images/ photographs are taken from Internet or Public domain.